

# David A. Dalrymple

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## Formal Education

2011–2012	<b>Harvard University</b> , Partial Ph.D., Biophysics	Took most of the neuroscience classes.
2008–2010	<b>Massachusetts Institute of Technology</b> , Partial Ph.D.	AI under Minsky and Sussman.
2006–2008	<b>Massachusetts Institute of Technology, S.M.</b> , Media Technology <i>Youngest-ever recipient of an MIT graduate degree (age 16).</i>	Massively parallel computing.
2000–2005	University of Maryland, Baltimore County, <b>B.S., Mathematics</b>	Analysis, matrix theory, neural nets...
2000–2005	University of Maryland, Baltimore County, <b>B.S., Computer Science</b>	Algorithms, data structures...

## Skills and Interests

Primary **areas of working knowledge**: Applied category theory, AI safety, mathematical modelling, interactive theorem proving, formal verification, modal and substructural logic, measure-theoretic probability, stochastic processes, machine learning, nervous system imaging and simulation, information theory, decision theory, game theory, mechanism design, numerical methods, control theory, philosophy of mind, metaethics

Computer science **areas of expertise**: Abstraction design (interfaces, visualizations, relational schemas, languages, or APIs), type theory, categorical semantics, data structures (distributed, in-core, or out-of-core), databases, numerical optimization algorithms, efficiency optimization of algorithms, data analysis, network protocols, \*nix system calls.

Selected **programming skills**: Coq, Rust, C++17, C, git, ARMv8, Metal, Intel 64, (La)TeX/TikZ, PostgreSQL

## Experience / Informal Education

**2021–2023** — Research Fellow, **Oxford University**, Faculty of Philosophy, Future of Humanity Institute. Metaethics with an eye toward aligning AIs with moral truth (in case that exists); then shifted to a sociotechnical safety-engineering approach which became the Open Agency Architecture.

**2017–Present** — Research Scientist, **Protocol Labs** (half-time). Co-inventor of the Filecoin protocol suite. Filecoin is now a top-30 cryptocurrency, and at its peak had a market cap over \$10B. More recently invented Hypercerts mechanism for public goods funding. Contributing to research on future Protocol Labs projects.

**2015–2017** — Intermittent software engineering & machine learning consulting; research at MIRI workshops.

**2015** — **MIRI Summer Fellow** (San Leandro, CA). Caught up on AI safety.

**2014** — Sr. Software Engineer, **Twitter**. Worked on the cache system, which serves 90% of Twitter's traffic. Added low-overhead performance monitoring to production cache services using reservoir sampling and Hoare's selection algorithm, and implemented a buffer type with tunable resize policies and a "zero-copy" specialization.

**2014** — **Recurse Center** participant. Produced many one-off hacks, mostly in C and assembly (visible on github); wrote technical articles on davidad.github.io, including two that reached the front page of Hacker News; taught several classes to fellow Recursers, ranging from analog circuit design to cloud app deployment techniques.

**2012–2013** — **MIT Research Affiliate** (San Francisco), funded by a personal grant from Peter Thiel. During this time I coordinated efforts in labs at MIT, UCSF, and University of Vienna aimed at creating a complete data-driven simulation of the nervous system of the nematode worm *C. elegans* using a mix of genetic engineering, custom electro-optical systems, and high-performance computing.

**2010–2011** — **Independent scientist** (Cambridge, MA), funded by a personal grant from Larry Page. Self-studied probability theory and machine learning, and implemented a PCA algorithm based on singular value decomposition for reliably extracting cellular signals from video of fluorescent *E. coli*. I also created a moderately sophisticated HTML5 interface for exploring the video data as well as the PCA results.

**2010** — Attended **Singularity University's** summer program for graduate students, and got a whirlwind introduction to the state of the art in fields ranging from synthetic biology to robotics; began studying neuroscience.

2005–2006 — **Consulting programmer** working with companies in Maryland and New York on B2B Web products.  
2001, 2002, 2003 — Summer intern at **Kurzweil Technologies**, contributing to AI and image processing projects.

## Academic Publications

2019 — “*Dioptics: A common generalization of open games and gradient-based learners*,” D. Dalrymple, **SYCO 5**: 5th Symposium on Compositionality, U. Birmingham, UK, 4–5 Sep 2019.  
2014 and 2012 — Served on programme committee of **Artificial General Intelligence (AGI)** conference.  
2013 — “*Physical principles for scalable neural recording*,” A. Marblestone, B. Zamft, Y. Maguire, M. Shapiro, T. Cybulski, J. Glaser, D. Amodei, P. Stranges, R. Kalhor, D. Dalrymple, *et al.*, **Frontiers in Computational Neuroscience** 7(137), doi:10/shp. Preprint featured in **Nature Physics** 9(525), doi:10.1038/nphys2736.  
2013 — “*Conneconomics: the economics of large-scale neural connectomics*,” A. Marblestone, E. Daugharthy, R. Kalhor, I. Peikon, J. Kebschull, S. Shipman, Y. Mishchenko, D. Dalrymple, B. Zamft, K. Kording, E. Boyden, A. Zador, G. Church, **bioRxiv**, doi:10.1101/001214  
2012 — “*Turing: brain model still incomplete*,” D. Dalrymple, **Nature** (March 15), doi:10/shq  
2010 — “*Reconfigurable Asynchronous Logic Automata*,” N. Gershenfeld, D. Dalrymple, K. Chen, A. Knaian, F. Green, E. Demaine, S. Greenwald, P. Schmidt-Nielsen, **ACM SIGACT-SIGPLAN Symposium on Principles of Programming Languages (POPL)**, pp. 1–6; doi:10/dv4xbp.  
2008 — “*Asynchronous Logic Automata*,” D. Dalrymple, N. Gershenfeld, and K. Chen, **AUTOMATA-2008: Theory and Applications of Cellular Automata**. pp. 313–322.

## Patents

**U.S. Patent #10,708,071**: Consensus Protocols in Distributed Computing Systems. Issued 2020 Jul 7.  
**U.S. Patent #10,615,979**: Replication-Related Protocols for Decentralized Networks. Issued 2020 Apr 7.  
**U.S. Patent #8,013,629**: Reconfigurable Logic Automata. Filed 2009 Sep 16; issued 2011 Sep 6.  
**U.S. Patent #8,035,414**: Asynchronous Logic Automata. Filed 2009 Apr 13; issued 2011 Oct 11.

## Teaching and Speaking Engagements

2023 — **Estonian Academy of Sciences**, Tallinn, Estonia: *An Open Agency Architecture for Safe Transformative AI*.  
2023 — **DeepMind UK Alignment Meetup**, London: *An Open Agency Architecture for Safe Transformative AI*.  
2022 — **Funding the Commons**, New York: *Hypercerts, on-chain primitives for impact markets*.  
2019 — **Eminent Thinkers in AI Governance**, Perth, Australia: *Cross-cultural alignment on AI governance concepts*.  
2018 — Protocol Labs’ **Lab Day**, San Francisco: Participated in panel discussion *Open Problems in Science* with Michael Nielsen and Juan Benet; presented on *IPLD Research & Future Directions*.  
2018 — **Midlands Graduate School**, U. Nottingham: *Type theory in decentralized computing*.  
2012 — **TEDxMontreal**: TED talk entitled *A new type of mathematics*.  
2010–2011 — **Teaching assistant to Marvin Minsky** for three iterations of his famous class “The Society of Mind.” Delivered guest lecture entitled *Mind vs. Brain: Confessions of a Defector*, which has over 35,000 views.  
2008 — Co-director of **Junction**, a summer program for high schoolers at MIT, and teacher of Junction’s introductory computer science course (which went from how to use the command line to AVL trees in 10 weeks).  
2007–2009 — Teaching assistant for MIT’s **How to Make Almost Anything**, and its less catchily-titled sequel, **How to Make Something That Makes Almost Anything** (on, *e.g.*, 3D printer design).  
2002 — **Microsoft Research**, Redmond, WA: Introduced future directions for embedded and distributed computing; had the largest attendance of any guest speaker at MSR.  
2001 — **IFPRI 2020 Vision**, German Federal Parliament, Bonn, Germany: *Decreasing world starvation*.  
2001 — **TED**, Monterey, CA.  
2000 — **Smithsonian Institute**, Washington, DC: *Multigenerational panel on the future of technology* and *Technology showcase*, both nationally televised.

## Trade Publications and Honors

Invited Delegate, *Meeting of Eminent Thinkers on Artificial Intelligence Governance*, Tsinghua University, Beijing (2019)

Member, Industrial Advisory Board, University of Birmingham School of Computer Science (2018–)

Essay *The Principle of Least Action* published in “This Idea Is Brilliant: Underappreciated Scientific Concepts Everyone Should Know” (2018)

Essay *Differentiable Programming* published in “Know This: Today’s Most Interesting & Important Scientific Ideas” (2017)

Interviewed in 2010 movie *The Singularity is Near*, giving Erdős–Bacon number of 5